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EXAMINER

SODERQUIST, ARLEN

ART UNIT

PAPER NUMBER

1743

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                      |  |  |
|------------------------------|--------------------------------------|--|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/087,708 | <b>Applicant(s)</b><br>MORRISON ET AL. |  |
|                              | <b>Examiner</b><br>Arlen Soderquist  | <b>Art Unit</b><br>1743                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |  |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____  |

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1. Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: in claim 1 the at least one fiber must be disposed in the body in order for a portion of the chemical of interest into the electrolyte. In claim 9 there is not sufficient structure defined for the electrochemical sensor to have a hollow fiber carry the sample through it.

2. Claims 2, 9-12 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each claim requires the electrolyte to be regenerative. It is not clear if the scope is a closed system and the electrolyte is regenerated within the closed system, if the electrolyte is simply required to be capable of regeneration by some means (electrolysis) or if adding new electrolyte can be considered to renew or regenerate the system as in the cited Burgess reference. If the system is meant to be a closed system then the claims need to include that in some manner as a limitation of the claims. For examination purposes the addition of new electrolyte or the use of an electrolyte that is capable of being regenerated (iodide or bromide) will be the scope used.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by Marinenko (US 3,966,413). In the patent Marinenko teaches an electrochemical chlorine flux monitor. This apparatus for monitoring the chlorine concentration of water has a unique internal calibration capability and a high sensitivity. A water sample is mixed with a solution of potassium iodide (electrolyte) and the reaction produces a mole of iodine for every mole of chlorine present in the water. The mixture is passed through a detection and calibration assembly. The iodine is detected amperometrically by a detection cell (the electrochemical sensor). Calibrant (known) iodine fluxes, equivalent in effect to the unknown chlorine-produced iodine fluxes, are supplied

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to the detection cell during calibration runs by means of an upstream calibration cell which electrolyzes the iodide (preferably added to distilled water) to iodine at flux rates given simply by the electrolyzing currents divided by Faraday's constant. An electronics package (the transmitter) having gain and offset controls and a concentration display is provided. The anticipation is based on the broader interpretation of claim 9

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 1-4 and 6-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marinenko (US 3,966,413) or Rose (US 4,049,382) in view of Shindo (US 4,268,279) and Raleigh (US 4,118,194).

In the patent Marinenko teaches an electrochemical chlorine flux monitor. This apparatus for monitoring the chlorine concentration of water has a unique internal calibration capability and a high sensitivity. A water sample is mixed with a solution of potassium iodide (electrolyte) and the reaction produces a mole of iodine for every mole of chlorine present in the water. The mixture is passed through a detection and calibration assembly. The iodine is detected amperometrically by a detection cell (the electrochemical sensor). Calibrant (known) iodine fluxes, equivalent in effect to the unknown chlorine-produced iodine fluxes, are supplied to the detection cell during calibration runs by means of an upstream calibration cell which electrolyzes the iodide (preferably added to distilled water) to iodine at flux rates given simply by the electrolyzing currents divided by Faraday's constant. An electronics package (the

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transmitter) having gain and offset controls and a concentration display is provided. Column 1 teaches that a growing concern has been focused on the environmental effects of chlorine and chlorine derivatives in aqueous ecosystems. Sewage treatment plants and power plants are the principal contributors of these contaminants to natural water systems. In sewage treatment plants chlorine is used to disinfect the sewage and decrease biochemical oxygen demand while in the power plants it is generally used to control fouling in heat exchangers. The presence of chlorine from these sources has caused massive fish kills in some areas. This column also teaches the need for a self-contained instrument to measure the chlorine concentration in natural waters. The instrument should provide a means for calibrating itself other than by using a standard solution of a reducing agent, such as As (III) because preparation of standard solutions in the field is not convenient and prolonged storage of the solutions results in slow oxidation of the reducing agent by air oxygen. Additionally, the instrument should provide a sensitivity down to parts per billion of chlorine as environmental investigations require information down to this order of magnitude. Column 3 teaches the use of an electrolyte solution of potassium iodide in a pH 4 buffer saturated with NaCl and shows the reaction between chlorine and iodide. Marinenko does not teach a hollow porous fiber for use in contacting the sample with the electrolyte or potassium bromide as the electrolyte.

In the patent Ross teaches a method of monitoring the total residual chlorine in solution. A sample stream is extracted from the solution and mixed with a reagent stream containing a dissociated complex of alkali metal ion and iodide ion, and an excess amount of iodide ion. Iodide ion reacts with all the residual chlorine in the sample stream and is converted to iodine. The activity of iodine is then measured in the resultant mixed stream with a first and second electrochemical potentiometric electrode, the first electrode having a noble metal oxidation-reduction element, and the second having an iodide sensitive membrane element. The total residual chlorine is determined from the activity of the iodine. Column 3 shows the reaction between the chlorine and iodide. Column 4, lines 32-39 teach the iodide reagent being buffered to an optimal pH by the addition of an acid reagent. A value of about 4.5 was chosen as optimum because at this slightly acidic pH, chlorine and chloramines react rapidly with iodide to form iodine while other oxidizing species such as Cr(VI) and Fe (III) do not. The discussion bridging columns 4-5 teach that the reagent is useful for other species that might be present.

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Ross does not teach a hollow porous fiber for use in contacting the sample with the electrolyte or potassium bromide as the electrolyte.

In the patent Shindo teaches a gas transfer process with a hollow membrane. In the process a liquid is allowed to contact with the inside of a microporous hollow fiber and a fluid to contact with the outside, thereby allowing the gaseous components contained in both fluids to transfer between said liquid and said fluid. For use in the process, the inner diameter of the hollow fiber should be 50 to 5,000  $\mu$  and the wall membrane should have an average micropore diameter of 0.01 to 0.5  $\mu$ . In cases where the liquid is water or a liquid substance with aqueous medium, the process can be used effectively by using a hollow fiber of a polyolefin or a fluorinated polyolefin. Column 4, lines 44-65 list examples of gaseous substances which can be treated including air, oxygen, nitrogen, ozone, carbon monoxide, carbon dioxide, ammonia, hydrogen sulfide, sulfur dioxide, NO<sub>x</sub>, hydrogen, helium, neon, argon, krypton, xenon, borane, silane; halogens such as chlorine and fluorine; hydrogen halides such as hydrogen fluoride and hydrogen chloride; lower alcohols having 1 to 6 carbon atoms such as methyl alcohol, ethyl alcohol, propyl alcohol, butyl alcohol and hexyl alcohol; lower mercaptans having 1 to 6 carbon atoms such as methyl mercaptan, ethyl mercaptan and butyl mercaptan; lower amines having 1 to 15 carbon atoms such as methylamine, ethylamine, propylamine, butylamine, dimethylamine, triethylamine and tributylamine; saturated or unsaturated hydrocarbons having 1 to 10 carbon atoms such as methane, ethane, propane, butane, hexane, butadiene, ethylene, acetylene, benzene, toluene and xylene; halogenated hydrocarbons having 1 to 10 carbon atoms such as carbon tetrachloride, chloroform, trichloroethylene, tetrachloroethylene, vinyl chloride, vinylidene fluoride and tetrafluoroethylene; and mixtures of above-listed compounds. Column 6, lines 52-63 teach that since the gas transfer is carried out efficiently by use of hollow fibers, the equipment can be made compact. Practical application fields include medical treatment devices, typically artificial lung and artificial kidney; analytical equipments such as gas sensor, gas chromatography and liquid chromatography; environmental pollution preventive appliances for removing noxious gases such as ammonia, hydrogen sulfide, sulfur dioxide, and the like; gas industries; biochemical and fermentation industries where the process can be utilized, for example, in removing alcohol from fermentation tanks or for the purpose of surveillance.

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Column 8, lines 8-39 list a number of advantages for using the Shindo device including its excellent gas-liquid contact properties and the ability to make a compact low cost device. Example 4 shows the use of the device to transfer ammonia from a solution in which it was contained.

In the patent Raleigh teaches a sensor for fluid components in which a solid electrolyte is used to liberate elemental halogen which is measured electrochemically. The device preferably used an iodide as the solid electrolyte. Table 1 shows some of the reactions. Column 6 lines 11-62 teach that there are many chlorogenic and bromogenic compounds that act in an analogous manner to the iodogenic compounds in sensing fluid components. For example, bromides such as aluminum bromide, boron bromide and beryllium bromide, will yield elemental bromine in response to a variety of oxidizing agents such as atmospheric oxygen and chlorine. Other bromides require more energetic oxidizing agents in order to yield elemental bromine or chlorine at a rate sufficient to activate the electrochemical cell. For example, potassium bromide (KBr) yields elemental bromine by reaction with chlorine or fluorine. An illustration of the compositions which comprise a salt and oxidizing agent is potassium bromide plus manganese dioxide which reacts with hydrogen chloride to yield elemental bromine.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the gas transfer fibers of Shindo into the Marinenko or Ross devices because of their ability to be used in environmental monitoring situations and provide an excellent way to contact gases with solutions resulting in a low cost means of transferring the gases between solutions as taught by Shindo. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a bromide electrolyte as taught by Raleigh into the Marinenko and Ross devices because of the equivalence taught by Raleigh.

7. Claim 5 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The art of record fails to teach or fairly suggest the structure of claim 5.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to gas transfer using porous membranes and electrochemical sensors.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose current telephone number is (571) 272-1265 as a result of the examiner moving to the new USPTO location. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Arlen Soderquist', with a stylized flourish at the end.

September 30, 2004

ARLEN SODERQUIST  
PRIMARY EXAMINER